

## Absorbent structure in an absorbent article and a method of producing it

### *Technical field*

The present invention refers to an absorbent structure in an absorbent article such as a  
5 diaper, pant diaper, incontinence guard, sanitary napkin, wound dressing, bed protection etc. and comprising a compressed foam material which expands upon wetting. The invention further refers to a method of producing the absorbent structure and an absorbent article containing the absorbent structure according to the invention.

### 10 *Background of the invention*

Absorbent articles of the above mentioned kind are intended to be used for absorption of body liquids such as urine and blood. They usually comprise a liquid pervious  
topsheets, which during use is intended to be facing the wearer's body, e g a nonwoven material of spunbond type, a meltblown material, a carded bonded wadding etc. They  
15 further have a liquid impervious backsheet, e g a plastic film, a plastic coated nonwoven or a hydrophobic nonwoven, and an absorbent structure arranged between the liquid pervious topsheet material and the liquid impervious backsheet. This absorbent structure may be constructed by several layers such as a liquid acquisition layer, storage layer and distribution layer.

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As a liquid acquisition layer there is usually used a porous material having a high momentaneous liquid receiving capacity. Examples of such material are cellulosic fluff pulp of thermomechanic or chemothermomechanic (CTMP) type, chemically stiffened cellulosic fibers, synthetic fiber structures of different types and porous foam materials  
25 etc.

As a storage layer there is usually used cellulosic fluff pulp mixed with so called superabsorbents, i e crosslinked polymers with the ability to absorb several times their own weight (10 times or more) of body fluids. It is also possible to use an absorbent  
30 foam material as a storage layer. As a distribution layer there can be used cellulosic fluff pulp, tissue layers, foam, synthetic fibers and the like having high liquid distribution capacity. It is also possible to combine two or more of the functions acquisition, storage and distribution in one and the same layer.

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It is previously known through US-A-3,512,450, EP-A-0 293 208 and EP-A-0 804 913 to use a compressed foam material of regenerated cellulose, e g viscose, as an absorbent structure in an absorbent article of the above mentioned kind, e g a sanitary napkin. The article may then be made very thin and still have a high absorption capacity. The compressed viscose foam expands quickly in the z-direction when liquid is absorbed by the material when wetted.

*Object and most important features of the invention*

The object of the present invention is to improve the function of an absorbent structure in the form of a compressed foam material especially with respect to liquid acquisition- and distribution capacity. This has according to the invention been achieved by the fact that the foam material comprises two integrated layers having different mean pore sizes.

- There is further referred to a method of producing an absorbent structure, comprising separately forming at least two different foam materials having different pore sizes and applying the foam materials on top of each other while still not dry, after which the combined material layers are dried and compressed.
- There is also referred to an absorbent article such as a diaper, a pant diaper, an incontinence guard, a sanitary napkin, a wound dressing, a bed protection etc. containing an absorbent structure according to the invention.

Further features of the invention are disclosed in the following description and of the claims.

*Description of drawings*

The invention will in the following be closer described with reference to an embodiment shown in the accompanying drawings.

- Fig. 1 shows a schematic cross section of an absorbent structure according to the invention in compressed form containing three different integrated layers
- Fig. 2 shows the absorbent structure according to Fig. 1 in expanded form.

**Fig.4 is a section according to the line IV-IV in Fig.3 on an enlarged scale.**

## 5 Description of embodiments

The absorbent structure 1 according to the invention comprises at least two, in the embodiment shown in Fig. 1 and 2 three, integrated layers 2, 3 and 4. Each layer consists of a compressed foam material, which upon contact with liquid expands strongly while absorbing the liquid. The layers have different pore sizes. With pore size 10 is meant the effective means pore size which the material has in expanded condition.

The effective means pore size is determined by means of a PVD (Pore Volume Distribution)-apparatus manufactured by Textile Research Institute, Princeton, USA. The function of the PVD-apparatus is described in detail in Miller, B. and Tyomkin, L. Textile Research Journal 56 (1986) 35.

15 The different layers 2, 3 and 4 are preferably integrated with each other and partly penetrate into each other so that there is no clear partitioning line between the layers but a mixture of the different pore sizes. By this the liquid transport between the layers is promoted.

20 According to a preferred embodiment the foam material is of regenerated cellulose, such as viscose, which is a foam containing a framework of cellulose. The principle for making a porous viscose foam is known since long ago and shortly takes place in the following way. Cellulose, usually sulphite pulp, is allowed to swell in sodium hydroxi-  
25 de. Carbon disulphide is added at which the cellulose is successively dissolved. In order to improve the mechanical strength in the material for example cotton fibers may be added. To this cellulose solution there is added and dispersed a salt in the form of sodium sulphate. When then the solution is heated the cellulose is regenerated (the Carbon disulphide is evaporated) and the salt (sodium sulphate) is dissolved by  
30 washing the material with water at which a porous spongelike structure is obtained. The material is dried and compressed if desired

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Superabsorbent materials may be added to the foam material in connection with the viscose production, i e before foaming. The concentration of superabsorbent preferably is in the form of a gradient, so that the layer with the largest pores contains the smallest amount of superabsorbent and the layer with the smallest pores contains the highest amount of superabsorbent. By this the largest liquid storage capacity is provided in the layer facing away from the wearer.

The superabsorbent material may also be applied on the dried foam, e g in the form of a monomer solution which is applied on the side of the which is intended to be facing away from the wearer. The monomer solution will then form a coating on one side of the foam and a part of the monomer solution will penetrate into the open pore system of the foam. The monomer solution is polymerized and is then crosslinked. With this method there is provided a gradient of the superabsorbent concentration from one side of the foam on which the monomer solution has been applied and a distance into the foam material, so far as the monomer solution has penetrated.

The monomer solution can also be in the form of a solution which when applied to the compressed foam runs into the pore system thereof and forms a coating on the pore walls.

The monomer solution may also be in the form of a foamed dispersion, which after application to one side of the compressed foam is polymerized and crosslinked. The advantage of applying the superabsorbent material in the form of a foamed dispersion is that a porous structure is formed also of the superabsorbent material, which promotes the liquid transport.

The foam material in the different layers may also be of different polymers, at which it for example would be possible to provide a hydrophilicity gradient i the z-direction by having foams of different hydrophilicity/hydrophobicity in the different layers.

In Fig. 3 and 4 there is shown an example of an absorbent article 5 in the form of an incontinence guard comprising a liquid pervious topsheet 6, a liquid impervious

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The absorbent structure 1 according to the invention may also be arranged over only a part of the total surface of the absorbent body of the absorbent article, e g in the

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